Title: Air Powered Geometry

Brief Overview:

This is an interdisciplinary activity which integrates mathematics, science, and art. Students will examine shapes and manipulate those shapes to create a science manipulative.

Link to Standards:

- **Problem Solving** Students will use problem solving approaches to investigate and understand mathematical content.
- **Communication** Students will analyze, clarify, and justify their ideas with the use of comparative terms.
- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will demonstrate their ability to connect geometric concepts to the scientific world.
- **Estimation** Students will determine reasonableness of their results. They will also demonstrate their ability to apply estimation strategies when creating geometric shapes.
- **Geometry & Spatial Sense** Students will describe, model, draw, and classify shapes. They will also investigate and predict the results of combining, subdividing, and changing shapes. Develop spatial sense. Relate geometric ideas to number and measurement ideas.
- **Measurement** Students will develop the process of measuring and the concepts related to the units of measurement.
- **Statistics & Probability** Students will collect, organize, describe data, and explore concepts of chance.
- **Fractions** Students will use geometric models to explore a whole, halves, and fourths.
- **Patterns & Relationships** Students will recognize, describe, and create a variety of patterns.

Grade/Level:

Grades 1-3

Duration/Length:

This activity should take 3-4, 45 minute class periods. (Extended activities may require more days.)

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Folding paper shapes
- Recognizing geometric shapes and their attributes
- Measuring length in standard units
- Awareness of safety precautions when using electrical appliances

Objectives:

Students will be able to:

- work cooperatively in groups.
- follow directions.
- construct a pinwheel.
- construct geometric shapes.
- predict outcomes.
- read and interpret data.
- record and analyze data.
- justify answers using data and mathematical reasoning.
- identify attributes of a square.
- identify various wind sources.
- communicate mathematically and scientifically using oral and written language.

Materials/Resources/Printed Materials:

- Power blocks
- Geoboards
- Geobands
- Rulers
- Quarters
- Crayons/markers
- Tape
- Fan
- Transparencies
- Blow dryer (optional)
- Straws or pencils (1 per student)
- Overhead Geoboard
- Overhead projector
- Scissors
- Unlined paper 8.5" x 11"
- Ziploc bags containing paper shapes
- Pushpins
- Recording chart for student
- Overhead projector pens
- Bellows (optional)

- Extension worksheets
- Construction paper
- Transparency of recording chart for teacher
- Pinwheel model

Development/Procedures:

Day 1: Attributes of a square

- Discuss attributes of a square.
- Locate squares within the classroom.
- Pass out power blocks for free exploration.
- Collect power blocks, then pass out the ziploc of the specific shapes (triangles and squares) needed to form a square.
- Students will then choose one square from the set of Power Blocks in the ziploc bag.
- Using equivalent triangles, cover the square (2, 4, 8 triangles).

Home Assignment: Locate and list examples of squares in your home.

Day 2: Making the Pinwheel

- Discuss home assignment.
- Pass out Geoboard. Model making the square, forming diagonals, and placing a circle in the middle of the square.
- Given 4 paper triangles, make a square.
- Ask the students to count the number of diagonals that all 4 triangles form.
- Pass out construction paper, measure, and cut a perfect square.
- Place a quarter directly in the center and trace around it.
- Decorate the square. (Try some stripe designs or **crazy** pictures.)
- Cut in from each corner to the edge of the circle.
- Label the corners A, B, C, D as you see on the teacher's model.
- Bend each lettered corner to the center.
- Once corners are folded to the center, place tape on centers.
- Place pushpin through all four corners into the center.
- Then put the pin into the eraser or into the end of a straw.
- Discuss sources of wind/air power that could rotate the pinwheel.

Suggestion: For the younger grades, have pattern available for students to trace and cut.

Home Assignment: Make a pinwheel to trade for an item of choice at the school store.

Day 3: Implementation of the Experiment

- Give each student a strip of paper (rectangular shaped) and get them to figure out a way to make the paper fly.
- Review types of wind sources.
- Predict how different wind sources will affect the pinwheel.

- Discuss with the class which wind source will have the greatest effect.
- Divide class into four groups. Make them aware of safety precautions needed to be followed during the lab.
- Pass out recording charts to each student.
- Get students to predict how each wind source will affect the pinwheel (speed) and record it on their chart.
- Students will record observations at each station (Did it move at a steady pace?).
- The four groups will rotate among the four stations (electric fan, blow dryer, human power, natural wind).
- Students will return to seat, record final results, and discuss.
- Possible factors that would have affected the results would also be discussed.

Performance Assessment:

With students' input, criteria will be established for an evaluation based on a rubric system. Scoring is 1 to 5 points, 5 being excellent. The following may be used as criterion for evaluation:

- Pinwheel construction
- Data recording
- Pinwheel movement

Extension/Follow Up:

The extension/follow-up activities will consist of other **Air Powered Geometric figures.** If some or all of the geometric figures are made, then a comparison of wind source can be conducted.

Extension Activity #1:

- Discuss the geometric shapes that this construction will consist of.
- **Project:** Paperbag kite.
- **Materials Needed**: a long slender bag recommended, scissors, string, and a florist wire circle.
- **Resource:** *Exploring Arts and Crafts with 2-6 year-olds: The Little Hands Art Book,* by Laurie Carlson. Copyright 1993, Judy Press, USA.

Extension Activity #2:

- Discuss the geometric shapes of the air mobile
- **Project**: Fabric Windsock
- **Materials Needed:** fabric strips, 3 x 36 poster board strips, string/yarn, glue, hole puncher
- **Resource:** *ECOART*! *Earth-Friendly Art and Craft Experiences for 3-9 year-olds,* by Laurie Carlson. Copyright 1993, Williamson Publishing, Charlotte, Vermont.

Extension Activity #3

- Discuss the geometric shapes of the air craft.
- **Project:** Circle chimes
- **Materials Needed:** small margarine bowl, fishing line, metal washers
- **Resource:** *Beautiful Junk: Creative Classroom Uses for Recyclable Materials*, by Karen Brackett and Rosie Manley. Copyright 1990, Fearon Teacher Aids, USA.

Authors:

Ernest Billingy
Prince Street Elementary
Wicomico County, MD

Nina Gaither
UMES Graduate Student
Somerset County, MD

Suzanne Walker
UMES Graduate Student
Somerset County, MD

STUDENT RECORDING CHART

	Fan	Wind	Human-Blow	Other
Prediction				
Observation				
Results				

PINWHEEL MODEL